The Embedded I/O Company

TAMC020-TM

MTCA.4 PIM-Carrier µRTM

Version 1.0

User Manual

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TAMC020-TM-10R

MTCA.4 PIM-Carrier µRTM, Mid-Size front panel

TAMC020-TM-11R

MTCA.4 PIM-Carrier µRTM, Full-Size front panel

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Style Conventions

Hexadecimal characters are specified with prefix 0x, i.e. 0x029E (that means hexadecimal value 029E).

For signals on hardware products, an ‚Active Low' is represented by the signal name with # following, i.e. IP_RESET#.

Access terms are described as:

W	Write Only
R	Read Only
R/W	Read/Write
R/C	Read/Clear
R/S	Read/Set

Issue	Description	Date
1.0.0	Initial Issue	October 2013

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1 Product Description

The TAMC020-TM is a standard Mid-Size/Full-Size MTCA.4 compliant Micro Rear Transition Module for the TAMC261.

It distributes all P14 I/O lines of a PMC residing on the TAMC261 from the zone 3 interface connectors to a PIM module slot.

Additional lines are connected to the M-LVDS control and data lines of a TAMC261-2xR. These are distributed to normally unused pins of the J10 PIM slot connector so that a special PIM can be used to connect the M-LVDS control and data lines to the PMC back I/O signals.

According to MTCA.4, the TAMC020-TM provides an I2C EEPROM, an I2C temperature sensor and an I2C I/O Extender device. The I/O Extender is used to provide various management signals on the µRTM, with the management being handled by the MMC of the TAMC261.

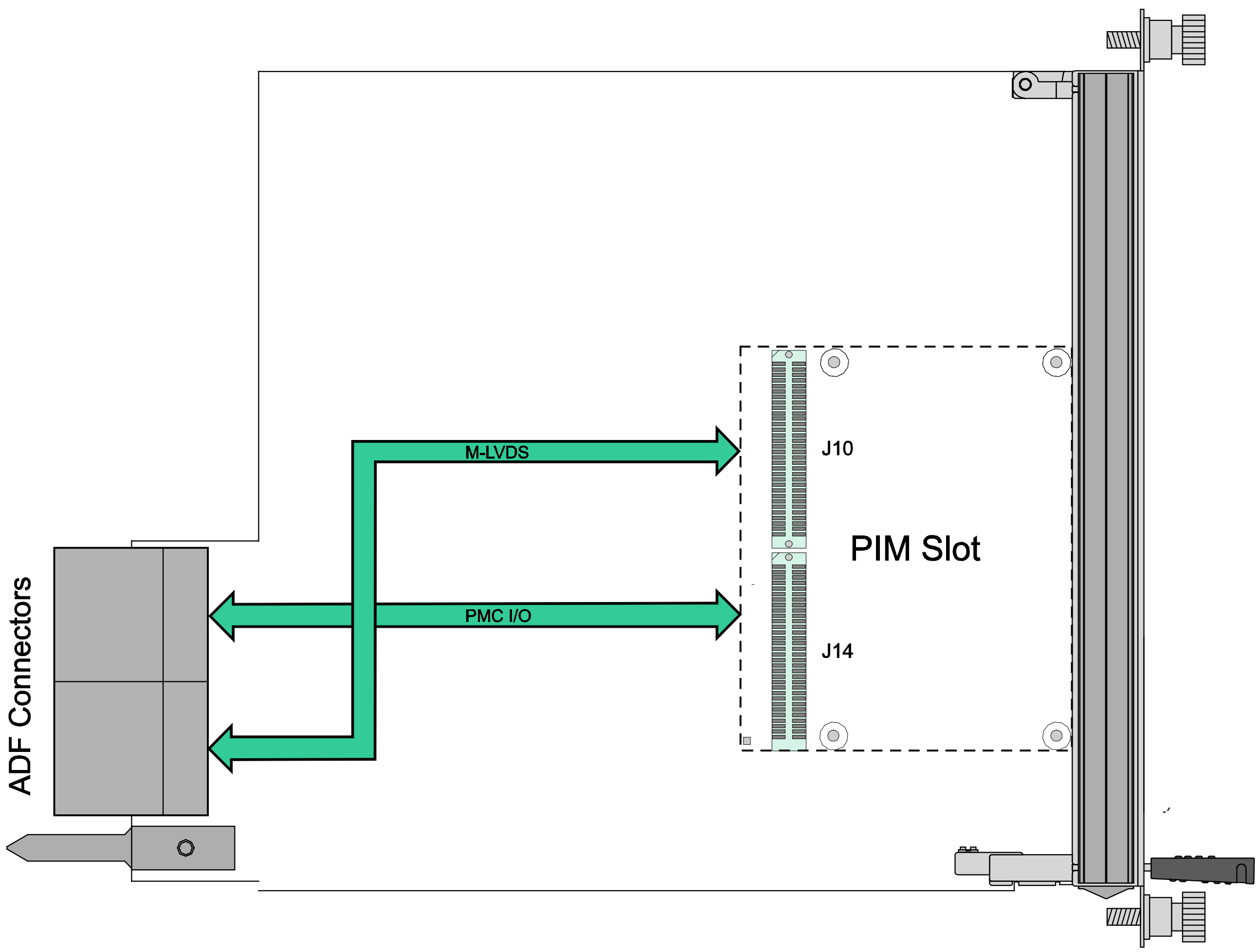


Figure 1-1 : Block Diagram

2 Technical Specification

AMC Interface		
Mechanical Interface	Rear Transition Module conforming to MTCA.4 Module Type: Double Mid-Size Module (-10R) Module Type: Double Full-Size Module (-11R)	
IPMI Support		
IPMI Version	1.5	
Front Panel LEDs	Blue Hot-Swap LED Red Failure Indication LED (LED1) Green Board OK (LED2)	
Main On-Board Devices		
I2C I/O Extender	PCA9534 (Texas Instruments)	
I2C EEPROM	M24C32 (ST Microelectronics)	
I2C Temperature Sensor	LM75 (National Semiconductor)	
I/O Interface		
I/O Connector	PIM I/O slot	
Physical Data		
Power Requirements	Management Power: 15mA typical @ +3.3V DC	
	Payload Power: Depends on mounted PIM. With a passive PIM: 0A @ +12V DC	
Temperature Range	Operating	-40°C to +85°C
	Storage	-40°C to +85°C
MTBF	865.000 h MTBF values shown are based on calculation according to MIL-HDBK-217F and MIL-HDBK-217F Notice 2; Environment: G_B 20°C. The MTBF calculation is based on component FIT rates provided by the component suppliers. If FIT rates are not available, MIL-HDBK-217F and MIL-HDBK-217F Notice 2 formulas are used for FIT rate calculation.	
Humidity	5 – 95 % non-condensing	
Weight	214 g	

Table 2-1 : Technical Specification

3 Handling and Operating Instructions

3.1 ESD Protection

The AMC module is sensitive to static electricity. Packing, unpacking and all other module handling has to be done in an ESD/EOS protected Area.

3.2 Thermal Considerations

Forced air cooling is recommended during operation. Without forced air cooling, damage to the device can occur.

3.3 Mid-size Option Usage Restrictions

Please note that the mid-size module has restrictions to its usage because of a component height violation. It is within the responsibility of the user to carefully check if the mid-size module with its component height violation can be used in the system. Otherwise, damage to the TAMC020-TM or the slot it is used in may occur!

Refer to the chapter “Component Height Violation on TAMC020-TM-10R” for details.

4 IPMI Support

The Front-AMC module provides a Module Management Controller (MMC) that performs health monitoring, hot-swap functionality and stores the Field Replaceable Unit (FRU) information. The MMC communicates via an Intelligent Platform Management Interface (IPMI) with superordinated IPMI controllers.

The TAMC020-TM is controlled by the Front-AMCs MMC and provides a temperature sensor, FRU information and management signals for hot swap handle status and LED control.

4.1 Temperature and Voltage Sensors

The MMC on the Front-AMC module monitors sensors on-board the TAMC020-TM and signals sensor events to the superordinated IPMI controller / shelf manager. Available sensors are listed in the table below.

Sensor Number	Signal Type	Thresholds	Signal Monitored
0	Event	-	Hot-swap switch
1	Temperature	lnr lcr lnc unc ucr unr	LM75

unr: upper non-recoverable, ucr: upper critical, unc: upper non-critical
lnr: lower non-recoverable, lcr: lower critical, lnc: lower non-critical

Table 4-1 : Temperature and Voltage Sensors

4.2 FRU Information

The TAMC020-TM stores the module FRU information in a non-volatile EEPROM. The actual FRU information data is shown below.

Area	Size (in Bytes)	Writeable
Common Header	8	no
Internal Use Area	0	no
Chassis Info Area	0	no
Board Info Area	variable	no
Product Info Area	variable	no
Multi Record Area		
Zone 3 Interface Compatibility Record	variable	yes

Table 4-2 : FRU Information

4.2.1 Board Info Area

Product Information	Value
Version	1
Language Code	0x00 - English
Manufacturer date/time	determined at manufacturing
Board manufacturer	TEWS TECHNOLOGIES GmbH
Board product name	TAMC020-TM
Board serial number	determined at manufacturing (see board label)
Board part number	TAMC020-TM-xxR -xx = -10 / -11

Table 4-3 : Board and Product Info Area

4.2.2 Product Info Area

Product Information	Value
Version	1
Language Code	0x00 - English
Product manufacturer	TEWS TECHNOLOGIES GmbH
Product name	TAMC020-TM
Board part/model number	TAMC020-TM-xxR -xx = -10 / -11
Product version	V1.0 Rev. A (see board label)
Product serial number	determined at manufacturing (see board label)
Asset tag	= Product serial Number

Table 4-4 : Board and Product Info Area

4.2.3 Multi Record Area

4.2.3.1 Zone 3 Interface Compatibility Record

Product Information	Value
Version	1
Type of Interface Identifier	0x03 - OEM Interface Identifier
Manufacturer ID (IANA) of the OEM	0x0071E3 (TEWS TECHNOLOGIES GmbH)
OEM-defined interface designator	0x81050000 (0x8 = TAMC, 0x105 = 261)

Table 4-5 : Zone 3 Interface Compatibility Record

If the Zone 3 Interface Compatibility record matches the Zone 3 Interface Compatibility record in the TAMC261, the TAMC261 considers the µRTM to be compatible. Otherwise, the TAMC261 considers the µRTM to be incompatible.

The Zone 3 Interface Compatibility records are considered as matching if the records are the same length and are identical from offset 9 to the end of the record. Otherwise the record is considered as not matching.

4.2.3.2 Module Current Requirements

As per µTCA.4 specification the TAMC020-TM current requirement must be included into the Front-AMC module's Module Current Requirement record.

The TAMC020-TM current requirements depend on the used PIM module:

If a passive PIM does not use of any of the PIM supplies, the TAMC020-TM current requirement is 0 A.

If an active PIM is used, the TAMC020-TM is able to supply up to 1 A on the +5 V and 1 A on the +3.3 V power rail. The ±12 V supply is capable of sourcing 100 mA each.

5 Functional Description

5.1 JTAG

The TAMC020-TM has no JTAG capable devices on-board; it just connects TDI with TDO, so that it does not break the Front-AMC's JTAG chain. TCK and TMS are left unconnected.

5.2 I2C Bus

The TAMC020-TM implements the following I2C devices / addresses on the µRTM I2C management bus:

Device Type	Device	I2C Address	
EEPROM	AT24C32	50h	1010000b
Temperature Sensor	LM75	48h	1001000b
8-Bit I2C I/O Port	PCA9534	20h	0100000b

Table 5-1 : µRTM I2C Devices

5.3 I2C I/O Extender

The µRTM provides an 8-Bit I2C I/O Extender device on the I2C management bus that is used for controlling certain management signals on the µRTM.

The TAMC020-TM implements the following pin/signal assignment for the µRTM I2C I/O Extender device:

I/O Port Bit	I/O Direction	Description
7	I	Payload Power Supply Status 0 = Payload Power Supply status is not Good 1 = Payload Power Supply status is Good
6	O	Payload (Zone 3) Enable Control 0 = Payload Enable signal not active 1 = Payload Enable signal active Enables PIM power supplies
5	O	Payload Reset Control Not used on the TAMC020-TM
4	O	EEPROM Write Protect Control 0 = EEPROM write protection not active 1 = EEPROM write protection active
3	O	LED2 (Green) Control 0 = LED off 1 = LED on
2	O	LED1 (Red) Control 0 = LED off 1 = LED on
1	O	Hot Swap LED (Blue) Control 0 = LED off 1 = LED on

0	I	Handle Status 0 = Handle/Switch closed 1 = Handle/Switch open

Table 5-2 : µRTM I2C I/O Extender Port Assignment

6 Installation

This chapter contains general notes regarding installing the µRTM into a system.

6.1 PMC Interface Module (PIM) Installation

Before installing a PIM, be sure that the power supply for the TAMC020-TM is turned off.

The components are Electrostatic Sensitive Devices (ESD). Use an anti-static mat connected to a wristband when handling or installing the components.

6.1.1 Using PIMs with Mid-size faceplates

The TAMC020-TM places the PIM directly at the AMC faceplate. A TAMC020-TM Mid-size faceplate provides a cut-out to ease the PIM installation. Pins of PIM I/O-connectors that protrude on PIM Side 2 may still contact the RTM front panel. This is a potential hazardous electrical problem, depending on the I/O circuitry used.

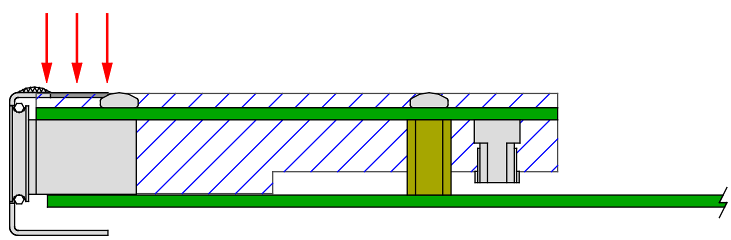


Figure 6-1 : Using PIMs with Mid-size faceplates

It is within the responsibility of the user to carefully check if a specific PIM can be used on a mid-size TAMC020-TM. If you are not sure that the available spacing to conductive parts of the PIM is sufficient, it is strongly recommended to use a TAMC020-TM with full-size front panel.

6.1.2 Component Height Violation on TAMC020-TM-10R

With a mounted standard PIM the Mid-Size TAMC261-x0 violates the µRTM component envelope defined in MTCA.4. The picture shows the violation of the hatched µRTM component envelope in red.

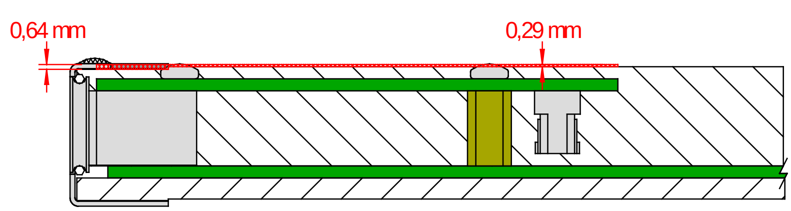


Figure 6-2 : Component Height Violation according to MTCA.4

In µTCA systems the adjacent AMC module provides enough spacing for the protruding PIM module. Despite the fact that the µRTM component envelope is violated by the PIM, the PIM does not cross the interboard separation plane, and a minimum distance between the PIM and the adjacent µRTM is guaranteed. This allows improving the density of the µTCA system.

If you are not sure that the available spacing is sufficient, it is strongly recommended to use the Full-Size TAMC020-TM-11R. It is within the responsibility of the user to carefully check if the Mid-Size module with its component height violation can be used in his system. Otherwise damage of the TAMC020-TM or the µRTM slot may occur!

6.1.3 Voltage Limits on PIM Modules

The AMC.0 specification limits the voltages on AMC modules to following thresholds:

	DC voltage	AC voltage
Positive	+27V	+27V peak
Negative	-15V	-15V peak

Table 6-1 : Voltage Limits on PIM Modules

For PIM modules using voltages (including I/O voltages) that exceed these thresholds, an additional insulation to adjacent modules or carrier boards becomes necessary.

6.2 µRTM Installation

During insertion and extraction, the operational state of the AMC is visible via the blue LED in the AMCs front panel. The following table lists all valid combinations of Hot-swap handle position and blue LED status, including a short description of what's going on.

Blue LED / Handle	On	Off	Long Blink	Short Blink
Open (Pulled out)	**Extraction:** Module can be extracted **Insertion:** Module is waiting for closed Handle	Module is waiting for hot swap negotiation	-	Hot swap negotiation in progress (Extraction)
Closed (Pushed all way in)	Module is waiting for hot swap negotiation	Module is active (operating)	Hot swap negotiation in progress (Insertion)	-

Figure 6-3 : Hot-Swap states

6.2.1 Insertion

Typical insertion sequence:

1. Insert the µRTM module into its slot, with the board edges aligned to the card guides
2. Fasten the screws of the front plate, so the module cannot be pushed out by the Front-AMC if it is inserted afterwards
3. Make sure that the module handle is pushed into the inserted position
    a. Blue LED turns “ON.” (Module is ready to attempt activation by the system)
    b. Blue LED starts “Long Blink” (Hot Swap Negotiation / Module activation in progress)
    c. Blue LED turns “OFF”, and green LED turns “ON” (Module is ready and powered)

When the Blue LED does not go off but returns to the “ON” state, the µRTM FRU information is incompatible to the Front-AMC.

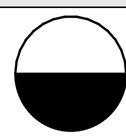
6.2.2 Extraction

Typical Extraction sequence:

1. Pull the module handle out ½ way
    a. Blue LED starts “Short Blink” (Hot Swap Negotiation in progress)
    b. Blue LED turns “ON” (Module is ready to be extracted)
2. Loosen the screws of the front plate
3. Pull the module handle out completely and extract the µRTM from the slot.

6.3 Zone 3 Keying

The TAMC020-TM provides the following male keying pin:

N	A Rotation	View	Voltage Levels
5	180	 white = clearance	Dependent on PMC Modules, but >±10V

7 Indicators

This chapter describes board indicators such as LEDs.

7.1 LED Indicators

7.1.1 Front Panel LEDs

For a quick visual inspection, the AMC module provides the following front panel LEDs.

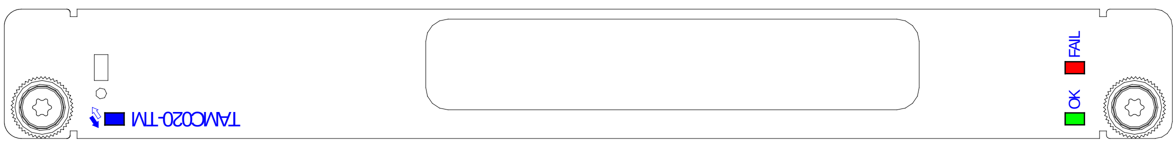


Figure 7-1 : Front Panel LED View

LED	Color	State	Description
HS	Blue	Off	No Power or µRTM is ready for normal operation
		Short Blink	Hot-Swap negotiation (extraction)
		Long Blink	Hot-Swap negotiation (insertion)
		On	µRTM is ready to attempt activation by the system or µRTM is ready to be extracted
FAIL	Red	Off	No fault
		On	Failure or out of service status
OK	Green	Off	µRTM is not powered up
		On	µRTM is powered and OK

Table 7-1 : Front Panel LEDs

8 I/O Connectors

This chapter provides information about user accessible on-board connectors

8.1 Overview

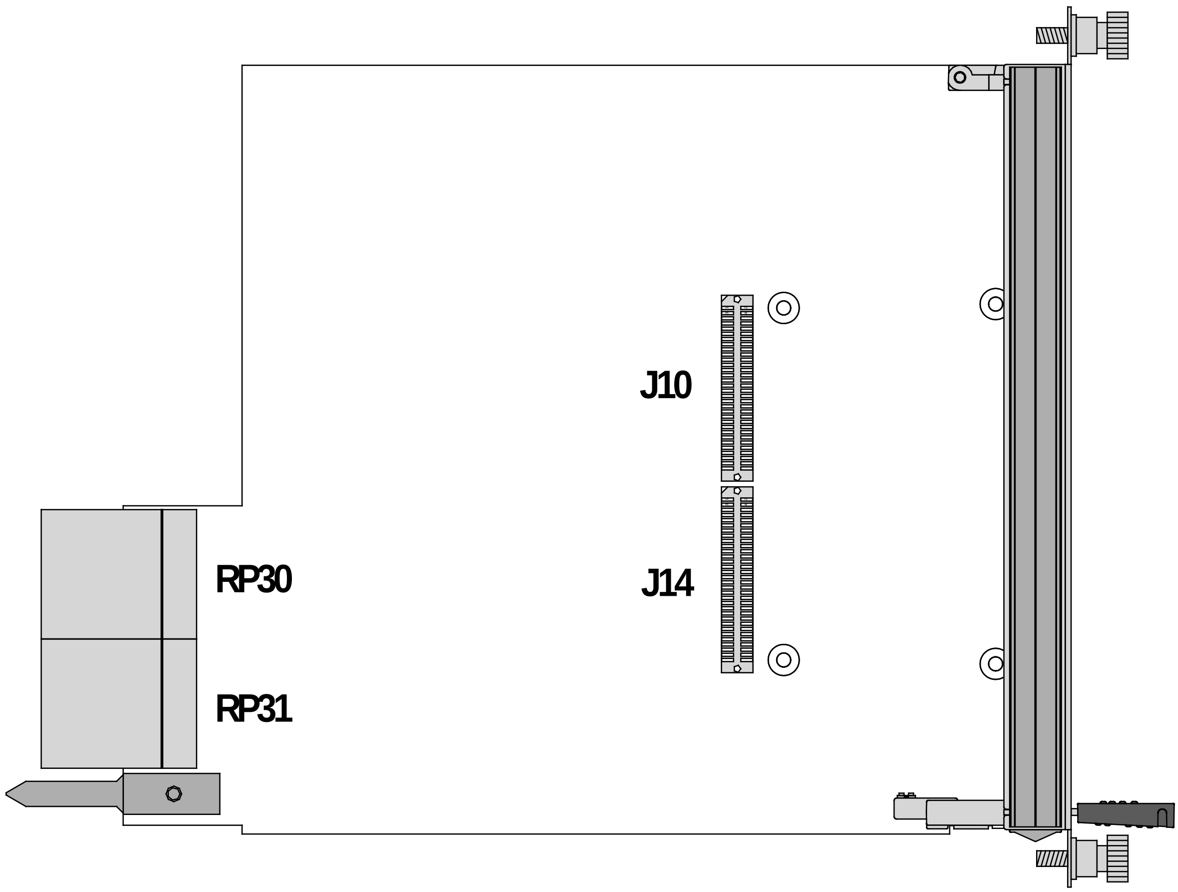


Figure 8-1 : Connector Overview

8.2 Board Connectors

8.2.1 Zone 3 Connectors

The TAMC020-TM provides two 30-pair ADF connectors (RP30 and RP31) at the Zone 3 Interface.

Pin-Count	30 contact pairs (60 signal contacts) + 30 GND pins
Connector Type	Advanced Differential Fabric (ADF) connector
Source & Order Info	Erni 204781 or compatible

8.2.1.1 RP30

ADF connector ground pins are not shown.

	F	E	D	C	B	A
10	IO_48	IO_47	IO_46	IO_45	IO_44	IO_43
9	IO_42	IO_41	IO_40	IO_39	IO_38	IO_37
8	IO_36	IO_35	IO_34	IO_33	IO_32	IO_31
7	IO_30	IO_29	IO_28	IO_27	IO_26	IO_25
6	IO_24	IO_23	IO_22	IO_21	IO_20	IO_19
5	IO_18	IO_17	IO_16	IO_15	IO_14	IO_13
4	IO_12	IO_11	IO_10	IO_9	IO_8	IO_7
3	IO_6	IO_5	IO_4	IO_3	IO_2	IO_1
2	µRTM_TMS	µRTM_TDI	µRTM_SCL	µRTM_MP	µRTM_PWR	µRTM_PWR
1	µRTM_TDO	µRTM_TCK	µRTM_SDA	µRTM_PS#	µRTM_PWR	µRTM_PWR

Table 8-1: Zone 3 RP30 Connector Pin Assignment

8.2.1.2 RP31

	F	E	D	C	B	A
10	-	-	Tx_20	DIR_Tx_20	Rx_20	DIR_Rx_20
9	Tx_19	DIR_Tx_19	Rx_19	DIR_Rx_19	Tx_18	DIR_Tx_18
8	Rx_18	DIR_Rx_18	Tx_17	DIR_Tx_17	Rx_17	DIR_Rx_17
7	TCLKD	DIR_TCLKD	TCLKC	DIR_TCLKC	TCLKB	DIR_TCLKB
6	TCLKA	DIR_TCLKA	Tx_15	DIR_Tx_15	Rx_15	DIR_Rx_15
5	Tx_14	DIR_Tx_14	Rx_14	DIR_Rx_14	Tx_13	DIR_Tx_13
4	Rx_13	DIR_Rx_13	Tx_12	DIR_Tx_12	Rx_12	DIR_Rx_12
3	-	-	IO_64	IO_63	IO_62	IO_61
2	IO_60	IO_59	IO_58	IO_57	IO_56	IO_55
1	IO_54	IO_53	IO_52	IO_51	IO_50	IO_49

Table 8-2: Zone 3 RP31 Connector Pin Assignment

8.2.2 PIM Slot Connectors

The I/O lines to PIM connector J14 are routed as 50Ohm single-ended length matched signals, but not as differential pairs. This approach may support differential signaling (e.g. for Ethernet etc.) but does not cause cross-talk when used with cards that provide single-ended I/O.

Pin-Count	64
Connector Type	PMC Connector
Source & Order Info	Molex 71436-2864 or compatible

8.2.2.1 J10

Pin	Signal	Pin	Signal
1	-	2	+12V
3	-	4	-
5	+5V	6	-
7	-	8	-
9	DIR_Rx_12	10	+3.3V
11	DIR_Tx_12	12	Rx_12
13	GND	14	Tx_12
15	DIR_Rx_13	16	Rx_13
17	DIR_Tx_13	18	GND
19	DIR_Rx_14	20	Tx_13
21	+5V	22	Rx_14
23	DIR_Tx_14	24	Tx_14
25	DIR_Rx_15	26	+3.3V
27	DIR_Tx_15	28	Rx_15
29	GND	30	Tx_15
31	DIR_TCLKA	32	TCLKA
33	DIR_TCLKB	34	GND
35	DIR_TCLKC	36	TCLKA
37	+5V	38	TCLKA
39	DIR_TCLKD	40	TCLKA
41	DIR_Rx_17	42	+3.3V
43	DIR_Tx_17	44	Rx_17
45	GND	46	Tx_17
47	DIR_Rx_18	48	Rx_18
49	DIR_Tx_18	50	GND
51	DIR_Rx_19	52	Tx_18
53	+5V	54	Rx_19
55	DIR_Tx_19	56	Tx_19
57	DIR_Rx_20	58	+3.3V
59	DIR_Tx_20	60	Rx_20
61	-12V	62	Tx_20
63	-	64	-

Table 8-3 : Pin Assignment J10 Connector

8.2.2.2 J14

Pin	Signal	Pin	Signal
1	IO_1	2	IO_2
3	IO_3	4	IO_4
5	IO_5	6	IO_6
7	IO_7	8	IO_8
9	IO_9	10	IO_10
11	IO_11	12	IO_12
13	IO_13	14	IO_14
15	IO_15	16	IO_16
17	IO_17	18	IO_18
19	IO_19	20	IO_20
21	IO_21	22	IO_22
23	IO_23	24	IO_24
25	IO_25	26	IO_26
27	IO_27	28	IO_28
29	IO_29	30	IO_30
31	IO_31	32	IO_32
33	IO_33	34	IO_34
35	IO_35	36	IO_36
37	IO_37	38	IO_38
39	IO_39	40	IO_40
41	IO_41	42	IO_42
43	IO_43	44	IO_44
45	IO_45	46	IO_46
47	IO_47	48	IO_48
49	IO_49	50	IO_50
51	IO_51	52	IO_52
53	IO_53	54	IO_54
55	IO_55	56	IO_56
57	IO_57	58	IO_58
59	IO_59	60	IO_60
61	IO_61	62	IO_62
63	IO_63	64	IO_64

Table 8-4 : Pin Assignment J14 PIM Connector